Business Cycles in Developing Countries: Are They Different?

John Rand and Finn Tarp

December 2001

Business Cycles in Developing Countries: Are They Different?

by
John Rand and Finn Tarp

Abstract
According to Lucas (1981) understanding business cycles is the first step in designing appropriate stabilization policies. In this paper, we demonstrate a series of ways in which developing countries differ from their developed counterparts when focus is on the nature and characteristics of macroeconomic fluctuations. Cycles are shorter, making it necessary to modify the filtering procedures normally applied for industrialized countries. This leads to different stylized facts of the business cycle across countries and regions, and the developing countries are more diverse than the rather uniform industrialized countries. Great care is therefore needed when the causal mechanisms in economic models are specified. A "one-size fits all" approach is unlikely to be appropriate.

Outline
1. Introduction
2. Business Cycle Duration and De-Trending
3. Business Cycle Dates and Duration in Developing Countries
4. Stylized Facts Revised
5. Discussion and Conclusion

I. INTRODUCTION

The widespread use of traditional Keynesian models in combination with the Phillips-curve to study business cycle fluctuations was severely challenged in the early 1970s. The new classical school pointed repeatedly to the missing microeconomic foundation. Subsequent critique of the new classical theories was, in turn, focused on the fact that they were unable to satisfactorily explain observed fluctuations in the industrialized economies. Nevertheless, the debate about the new classical revival helped resurrect business cycle analysis and stimulate the development of both the new Keynesian school and the Real Business Cycle (RBC) theory.

In recent years, focus has been on how well the new Keynesian and RBC models explain the so-called stylized facts of business cycles. Yet, existing literature is almost exclusively concerned with developed countries. Only scant attention has so far been paid to macroeconomic fluctuations in developing countries, the notable exceptions being Agénor, McDermott and Prasad (2000) and Pallage and Robe (2001).[1] In these contributions, it is assumed that the length of the cycles is comparable to the duration in developed countries. In this paper, we investigate whether this assumption is valid based on a sample of 15 developing countries. Verifying the correct duration of macroeconomic fluctuations is critical. The stylized facts that emerge from simple business cycle analysis are very sensitive to the chosen distinction between business cycles and the underlying growth performance.

Analyzing business cycles is useful for a variety of reasons. Canova (1998a, 1998b) highlights that such insights may guide researchers in choosing leading indicators for economic activity, and provide a set of "regularities" which macroeconomists can use as a benchmark to examine the validity of numerical versions of theoretical models. Burnside (1998) agrees with Canova on this point, and furthermore discusses the importance of applying more than one filter when de-trending is undertaken. When data are de-trended information is lost, and the nature of the information lost depends on the filter used. Any

[1] Agénor, McDermott and Prasad (2000) have 12 developing countries (mainly middle-income countries) in their sample from which stylized facts are derived for 14 indicators. Pallage and Robe (2001) have 63 countries in their sample but only consider stylized facts related to foreign aid, including multilateral and bilateral aid and commitments as well as disbursements.

filter has the potential of masking differences between models and data. In this paper, we therefore apply both the Hodrick-Prescott (HP) and the Band-Pass (BP) filter. Burnside and Canova do not agree, however, on the existence of a single set of stylized facts about business cycles. We do not pretend to enter this long-standing controversy. We adopt instead the taxonomy proposed by the National Bureau of Economic Research (NBER) and derive a set of stylized facts covering 15 indicators for 50 developing countries. They turn out to be clearly different from those of industrialized countries.

The paper is organized in five sections. Following this introduction, Section 2 provides an overview of the methodology used to estimate the duration of the business cycles. The de-trending procedures are also described in some detail. Section 3 goes on to document our estimates of the duration and turning points of the business cycles in developing countries, and in Section 4 we derive the implications hereof for the stylized facts. Section 5 concludes and discusses the implications for future research.

II. BUSINESS CYCLE DURATION AND DE-TRENDING

In their seminal contribution to the so-called classical business cycle literature, Burns and Mitchell (1946) define business cycles as follows:

> Business cycles are a type of fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own (Burns and Mitchell, 1946, p. 3).

Based on this general approach, researchers at the National Bureau of Economic Research (NBER) have for some 75 years worked on the identification of business cycle turning points in a model free environment.[2] Using monthly series on output, income, employment and trade for an increasing number of sectors, cyclical peaks and troughs have been estimated for each series using a variety of estimation techniques.

2 See http://www.nber.org/cycles.html and Mitchell (1927).

Supplementing all this with qualitative judgments on the persistence and seriousness of cyclical movements across sectors has formed the basis for the identification of common turning points, including their dates.[3] It is the latter summary information on the aggregate business cycles that is made publicly available.

The classical methodology of Burns and Mitchell (1946) and the NBER is complex and demanding in terms of analytical capacity. Bry and Boschan (1971) therefore simplified it, and the proposed Bry and Boschan (BB) procedure is based on a single reference series (typically real GDP). The adherent analytical steps and set of decision rules for selecting turning points in the business cycles are summarized in Table 1.

Table 1. *Bry and Boschan (BB) procedure for programmed determination of turning points*

1. Determination of extremes and substitution of values
2. Determination of cycles in twelve month moving average (extremes replaced).
   A: Identification of higher (or lower) than five months on either side.
   B: Enforcement of alternation of turns by selecting highest of multiple peaks (or lowest of multiple troughs).
3. Determination of corresponding turns in Spencer curve (extremes replaced).
   A: Identification of highest (or lowest) value within +/- five months of selected turn in twelve month moving average.
   B: Enforcement of minimum cycle duration of fifteen months by eliminating lower peaks and higher troughs of shorter cycles.
4. Determination of corresponding turns in short-term moving average of three to six months, depending on months of cyclical dominance (MCD).
   A: Identification of highest (or lowest) value within +/- five months of selected turn in Spencer curve.
5. Determination of turning points in unsmoothed series.
   A: Identification of highest (or lowest) value within +/- four months, or MCD term, whichever is larger, of selected turn in short term moving average.
   B: Elimination of turns within six months of beginning and end of series.
   C: Elimination of peaks (or troughs) at both ends of series which are lower (or higher) than values closer to the end.
   D: Elimination of cycles whose duration is less than fifteen months.
   E: Elimination of phases whose duration is less than five months.
6. Statement of final turning points.

Source: Bry and Boshan (1971, p. 21).

[3] A contraction period is defined as the time from peak to trough of a cycle. Similarly, an expansion period is defined as the time between trough and peak.

All classical views of macroeconomic fluctuations involve an analysis of total increases/declines in output and/or other indicators over a given time period independent of the underlying nature of the change. In contrast, a competing approach in the business cycle literature, which we will tentatively refer to as the modern approach, has focused on the cyclical fluctuations in economic time series data around their long run trends. These short-term fluctuations are often referred to as growth cycles, and they are identified through the application of a trend adjustment procedure. Burns and Mitchell (1946) argue against the use of such trend adjusted data. De-trending may involve the loss of critical information. Stock and Watson (1999) document that the focus on growth cycles (i.e., the cyclical part of macroeconomic changes over time) has both advantages and disadvantages as compared to the classical attention to aggregate changes. They recognize that ignoring the trend (or the cyclical component) is inconsistent with various economic models. For example, in traditional growth models productivity shocks determine both the long run economic path and cycles around this trend. On the other hand, growth cycle analysis may well be more robust (and useful for policy purposes) when the underlying trend growth rate in the economy is separated out.[4]

Modern studies of the properties of business cycles have generally relied on linear filters to separate trend and cyclical components. The standard procedure is therefore to de-trend the data series using some approximation to an ideal filter and subsequently compute sample second moments based on the cyclical component. Most researchers have used either the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997) or the Band-Pass (BP) filter (Baxter and King, 1998). As compared to a standard first differencing filter, the more complex HP-filter has the advantage that it does not amplify high frequency noise. Nevertheless, a drawback is that the HP-filter at the same time allows much of the high frequency noise to be left outside the business cycle frequency band. The low pass BP-filter has been adjusted to take account of this problem,[5] but it has a tendency to underestimate the cyclical component. In our analysis we therefore use both the HP and

[4] Stock and Watson (1999, p. 9) illustrate this with reference to post-war Japan, which has experienced very high growth rates and few absolute declines (and thus few classical business cycles). Nevertheless, Japan has experienced various policy relevant growth cycles.

5 This is done using a twelve quarter centered moving average, where weights are chosen so as to minimize the squared difference between the optimal and the approximate filters, subject to the constraint that the filter has zero gain at frequency zero. See Stock and Watson (1999, p. 12) for a good illustrative description of how the different filters work.

the BP filters to accommodate the debate between Canova (1998a, 1998b) and Burnside (1998) on appropriate filters.

After the revival of interest in business cycle research following Kydland and Prescott (1982) an enormous amount of research has been based on an eight-year distinction between business cycles and growth. Moreover, both the HP and the BP filters are designed to cut off low frequency cycles of more than 32 quarters duration. This implies that a smoothing parameter (λ) is chosen for the HP-filter so $\lambda = 1600$ and $\lambda = 100$ when seasonally adjusted quarterly and annual data are used, respectively. While it is common to define modern business cycles as fluctuations in economic time series with a periodicity of eight years or less, there is limited empirical evidence for this practice when it comes to industrialized countries. While the choice of eight years may be appropriate in the case of the US, studies concerning OECD countries suggest that six years is likely to be a more appropriate duration of the business cycles (Pedersen, 1998). Different smoothing parameters are therefore called for.

For developing countries, we know of no study that has tried to estimate the duration of the business cycles, and they may well be different from those of developed countries. Relying on the above smoothing parameters when studying poor countries is therefore at best ad hoc, and may lead to inappropriate conclusions as regards the summary statistics (or stylized facts) that characterize macroeconomic fluctuations.[6] In the extreme, inappropriate numerical models might be validated and vice versa, depending on the choice of smoothing parameter. We therefore move on to estimate the duration of the business cycles in 15 developing countries.

III. BUSINESS CYCLE DATES AND DURATION IN DEVELOPING COUNTRIES

To estimate the duration of business cycles, their turning points must be identified. For this we apply the BB-procedure, programmed in MATLAB,[7] on the 15 countries in our

[6] Choosing a smaller value of the smoothing parameter removes a larger part of the variance of the series since more low frequency movements are filtered away. As a consequence, the standard deviation can be significantly affected. The smoothing parameter also affects the computed second moments, implying that it may be important whether business cycles are defined as cycles with a duration of less than eight years or less than six or seven years.

[7] The computer code can be obtained from the authors on request.

sample. They include five Sub-Saharan African countries, five from Latin America, and five from Asia and North Africa as shown in Table 2.[8] Because of the difficulty of obtaining reliable quarterly GDP data for all of the countries in the sample, we use indexes of industrial production as a proxy for the aggregate business cycle. We therefore follow Agénor, McDermott and Prasad (2000), who argue that because output in the industrial sector corresponds roughly to output in the traded goods sector and is closely related to business cycle shocks for the countries analyzed, this variable is a reasonable proxy for measuring the aggregate business cycle. The primary data source is the International Monetary Fund (IMF) International Financial Statistics (IFS), where real output data are approximated by either the industrial production or the manufacturing production index. Data are available for varying time periods in the 15 countries, but the period 1980-99 is well covered across countries. Results are summarized in Table 2.

Table 2. *Duration of the business cycle for 15 developing countries (in quarters)*

Region	Country	Period (Q=quarter)	Average expansion length	Average contraction length	Average length of the business cycle
Sub-Sah. Africa	South Africa	61,Q1-99,Q4	5.8	5.9	11.8
	Malawi	70,Q1-99,Q4	5.9	5.4	12.0
	Nigeria	70,Q1-99,Q4	4.0	5.5	9.5
	Cote d´Ivoire	68,Q1-99,Q4	4.8	4.8	9.7
	Zimbabwe	78,Q1-99,Q4	5.1	5.3	10.4
Latin America	Uruguay	79,Q1-99,Q4	4.9	4.3	9.1
	Columbia	80,Q1-98,Q4	5.0	4.7	9.7
	Peru	79,Q1-99,Q4	4.6	4.3	9.4
	Chile	60,Q1-99,Q4	3.7	3.8	7.8
	Mexico	60,Q1-99,Q3	4.8	4.7	9.5
Asia and N. Africa	India	60,Q1-99,Q4	3.1	4.7	8.1
	Korea	60,Q1-99,Q4	6.3	10.4	18.1
	Morocco	60,Q1-99,Q4	3.7	4.0	7.7
	Pakistan	70,Q3-99,Q4	5.4	5.8	11.2
	Malaysia	70,Q1-99,Q4	4.2	4.9	9.6
All Countries	All		4.8	5.2	10.2

Notes: Because of missing data for some quarters for Zimbabwe and Cote d´Ivoire, some adjustments had to be made for these two countries in order to estimate the duration of the business cycle using the Bry and Boschan procedure.

[8] The countries from North Africa should clearly not be grouped with Sub-Saharan Africa due to major differences in economic indicators. To facilitate the presentation of our results they have been grouped under the heading of Asia and North Africa.

For Latin American countries the average length of the expansion periods is longer than the contraction period, whereas the opposite is characteristic for Asian and North African countries in the sample. It is more difficult to find a pattern in the business cycle duration for Sub-Saharan African countries. Yet, it does appear that the average duration of the business cycle is longer than in the other regions. Generally, it is clear from this analysis that the average length of the business cycle for all developing countries is only between seven and 18 quarters, equivalent to no more than four and a half years. While some variation exists, a period of up to eight years duration cannot be justified. Taking account of the standard deviation of the results (no more than five quarters), six years is a more appropriate choice as upper limit.

Following Pedersen (1998) this has two important implications. When the cyclical component has cycles with less than six years duration and when the near integrated time series are filtered, the optimal value of the smoothing parameter (λ) for the HP-filter is between 310 and 340. Setting $\lambda = 1600$ will lead to distorted results. Similarly, also the BP-filter should be configured differently to reflect the appropriate cycle duration.

Next, consider the actual peaks and troughs for the 15 developing countries in our sample as reported in Table 3-5. The interesting questions in the present context are whether (i) the timing of recessions and booms are independent across the 15 countries in the sample (i.e., whether there is a common business cycle), and (ii) how business cycles in developing countries are related to cycles in the industrialized countries. Artis, Kontolemis and Osborn (1997) find relatively synchronous peaks/troughs in the years 1973-74, 1979-80 and 1989-90 for G7 and European countries. It is evident that the first two of these turning points reflect the two international oil crises, and the last episode seems correlated with the collapse of Eastern Europe. Besides these three events not much is apparent in terms of common business cycle features in the industrialized countries.

Table 3 documents the peaks and troughs during the period 1980-98 for the five Sub-Saharan African countries. It appears that the second oil crisis and related events affected these countries with a lag as compared to the trough in the industrialized countries. Nevertheless, country specific circumstances appear to have played some role in the more specific timing of the beginning of the recession that is not quite as regular as in the Latin

American sub-sample, as discussed below.[9] The turning points of the business cycles in Sub-Saharan African countries vary considerably, though a common trough is evident in 1985, reflecting the general economic depression in Africa during the 1980s. In South Africa recessions got shorter during the period 1980-98, but business cycle features for Nigeria, Zimbabwe and Cote d'Ivoire did not change much during the sample period. Thus, no improvement took place, and in the case of Malawi, the duration of recessions even increased, confirming the troubling difficulties experienced by Malawi (see IMF, 2001b, and Mosley, Harrigan and Toye, 1991).

Table 3. *Peaks and troughs for Sub-Saharan African countries 1980-98*

	South Africa	Malawi	Nigeria	Cote d´Ivoire	Zimbabwe
Peak/Trough	81,Q4 - 83,Q1	80,Q3 - 82,Q1	81,Q1 - 83,Q1	81,Q1 - 82,Q4	82,Q2 - 83,Q1
Peak/Trough	84,Q2 - 85,Q3	83,Q3 - 85,Q1	84,Q1 - 85,Q2	84,Q1 - 85,Q3	84,Q1 - 85,Q4
Peak/Trough	86,Q3 - 87,Q2	86,Q3 - 88,Q1	86,Q1 - 86,Q4	86,Q2 - 87,Q3	86,Q3 - 88,Q1
Peak/Trough	88,Q1 - 89,Q1	89,Q3 - 91,Q1	87,Q4 - 90,Q2	89,Q1 - 90,Q3	89,Q1 - 90,Q1
Peak/Trough	90,Q1 - 91,Q1	92,Q3 - 94,Q2	91,Q2 - 92,Q3	92,Q1 - 93,Q3	90,Q4 - 93,Q1
Peak/Trough	92,Q4 - 94,Q2	95,Q3 - 97,Q2	93,Q4 - 94,Q4	94,Q4 - 95,Q3	93,Q4 - 95,Q1
Peak/Trough	95,Q3 - 96,Q4		95,Q4 - 96,Q3	96,Q2 - 97,Q3	

Turning now to the Latin American countries in Table 4, they also experienced a common, lagged trough following the second oil crisis as compared to the industrialized countries. The synchronized trough in the Latin American countries took place in 1982. But otherwise the turning points for the individual countries seem country specific. Consistent with the average results in Table 2 the expansion periods are longer for Uruguay, Peru and Mexico during 1980-98 than the contraction periods. However the recessions clearly got shorter in Mexico during the 1980s and 1990s as compared with recessions in the 1960s and 1970s. Whether this is due to improved economic policy, exogenous factors or some combination hereof is an issue we will not pursue further here, but see for example Giugale, Lafourcade and Nguyen (2001) and Lustig and Ros (1993). Columbia experienced recessions and expansions during 1980-98 of almost identical duration, whereas Chile had much shorter recession periods as compared with earlier decades. This fits well with prior insights about the Chilean economic performance

[9] Data do not allow systematic comparison with experiences following the first oil crisis for Sub-Saharan Africa, but scattered observations not reported here seem to indicate that this variability (i.e. the timing of the onset of the recession in individual countries) was even more pronounced in the early 1970s.

discussed in Solimano (1993) and IMF (2001a). All in all, when the time period for the analysis of Latin American countries is shortened, it becomes clearer that the average expansion periods are longer than the average contraction periods, reflecting improved economic performance in more recent years.

Table 4. *Peaks and troughs for Latin American countries 1980-98*

	Uruguay	Columbia	Peru	Chile	Mexico
Peak/Trough	80,Q3 - 82,Q1	80,Q4 - 82,Q1	80,Q4 - 82,Q1	80,Q4 - 82,Q1	81,Q3 - 83,Q1
Peak/Trough	83,Q4 - 84,Q3	83,Q4 - 85,Q1	83,Q4 - 85,Q2	83,Q2 - 84,Q1	85,Q3 - 86,Q3
Peak/Trough	85,Q3 - 87,Q1	86,Q3 - 88,Q1	86,Q4 - 89,Q1	85,Q3 - 86,Q3	87,Q2 - 88,Q1
Peak/Trough	88,Q4 - 89,Q3	89,Q3 - 90,Q3	89,Q4 - 90,Q3	87,Q2 - 88,Q1	88,Q4 - 89,Q3
Peak/Trough	90,Q4 - 92,Q1	91,Q4 - 93,Q1	91,Q2 - 92,Q3	88,Q4 - 89,Q3	90,Q4 - 91,Q3
Peak/Trough	92,Q4 - 94,Q1	93,Q1 - 95,Q1	94,Q2 - 95,Q1	90,Q2 - 91,Q1	92,Q2 - 93,Q1
Peak/Trough	94,Q4 - 95,Q3	95,Q4 - 96,Q3	95,Q4 - 96,Q3	91,Q4 - 93,Q1	93,Q4 - 94,Q3
Peak/Trough	96,Q4 - 97,Q3			94,Q2 - 95,Q3	

The business cycles of Asian and North African countries included in Table 5 were influenced by the oil crisis at very different points in time. The relevant dates are almost randomly distributed. It would clearly be interesting to expand the sample to see whether this observation is robust, but the necessary data are not available. In addition, it is only in the case of Malaysia that shorter recession periods were experienced during the period 1980-98 as compared with previous decades.

Table 5. *Peaks and troughs for Asian and North African countries 1980-98*

	India	Korea	Morocco	Pakistan	Malaysia
Peak/Trough	80,Q1 - 81,Q2	81,Q4 - 85,Q1	80,Q4 - 81,Q3	80,Q1 - 81,Q3	82,Q3 - 83,Q4
Peak/Trough	82,Q1 - 83,Q2	87,Q2 - 88,Q2	82,Q2 - 83,Q1	82,Q2 - 83,Q3	85,Q4 - 87,Q1
Peak/Trough	84,Q1 - 85,Q2	90,Q3 - 92,Q3	83,Q4 - 84,Q3	85,Q1 - 86,Q2	87,Q4 - 89,Q1
Peak/Trough	86,Q1 - 87,Q2	93,Q2 - 94,Q1	85,Q2 - 86,Q1	87,Q1 - 88,Q3	89,Q4 - 91,Q2
Peak/Trough	88,Q1 - 89,Q2	94,Q4 - 98,Q2	86,Q4 - 89,Q1	90,Q1 - 91,Q3	92,Q4 - 94,Q4
Peak/Trough	90,Q1 - 91,Q2		89,Q4 - 90,Q3	93,Q1 - 94,Q3	95,Q4 - 97,Q1
Peak/Trough	92,Q1 - 93,Q2		91,Q4 - 92,Q3	96,Q1 - 97,Q3	
Peak/Trough	94,Q1 - 95,Q1		93,Q4 - 95,Q1		
Peak/Trough	96,Q1 - 97,Q3		95,Q4 - 97,Q1		

The very frequent and long duration of recession periods in the countries in this sample may appear somewhat surprising as they are generally considered relatively well-managed economies. This highlights that business cycle analysis based on turning points

does not capture the depth and shape of the downturn, and similarly for the upturn.[10] To illustrate this point consider Figure 1 where two recessions with different duration are shown. It is clear that the cumulated welfare loss shown as areas A and B are not necessarily different. In other words, it cannot (as often done) be concluded that countries experiencing long recession periods have greater output loss than countries with shorter recession periods. It may well be more critical to avoid deep recessions. This underscores the importance of distinguishing between different kinds of recessions (including both duration and amplitude) when economic policy advice is formulated.

All in all it can be concluded that the developing countries in our sample were influenced differently in terms of timing (i.e., with a lag) by the second oil crisis than the industrialized countries. This suggests that business cycles in developing countries may well be as much a result of recessions in the industrialized countries as a consequence of the original international crisis itself. This hypothesis about the vulnerability of developing countries is supported by Kouparitsas (2001). He evaluates the extent to which macroeconomic fluctuations in developing non-oil producing countries are caused by shocks originating in the industrialized countries. Based on a computable general equilibrium model he finds a strong transmission mechanism of the business cycle. His results indicate that fluctuations in output of the industrialized countries may well account for about 70% of the variation in the consumption of developing countries.

Finally, our results document that the average duration of business cycles in developing countries is shorter than in the industrialized countries. Developing countries are different, and in general, they move relatively quickly from peak to trough and vice-versa. This is costly as documented by Ramey and Ramey (1995) and clearly reflects the insufficient capacity to counteract exogenous influences, including the limited extent of automatic stabilization. In Section 4, we move on to derive the stylized facts that emerge when the shorter business cycle duration is taken into account.

[10] For an interesting study of the welfare losses incurred by 33 countries due to business cycles during the last three decades see Pallage and Robe (2000).

IV. STYLIZED FACTS REVISED

In this section we apply the de-trending procedure described in Section 2 in combination with the modified smoothing parameters, estimated from the results in Section 3. A revised set of stylized facts emerges for 50 developing countries, including both low and middle-income countries. Detailed results are presented for Latin America, Sub-Saharan Africa and Asia and North Africa in a set of standard tables, including Table 6a and 6b to 11a and 11b, where a and b refers to the use of respectively the HP and the BP filter in the de-trending procedure. Data sources include World Development Indicators (World Bank, 2000), Global Development Finance (World Bank, 2000), International Financial Statistics (IMF, 2000), International Development Statistics (OECD, 2000) and Macroeconomic Time-series from the World Bank WebPages.

(a) *Sub-Saharan Africa*

A key issue concerning business cycle fluctuations in developing countries is whether aggregate fluctuations in the various indicators are characterized by time series properties, such as volatility and persistence, which are similar to the characteristics observed in industrialized countries. Examining summary statistics for the filtered cyclical components, it can be seen from Table 6a and 6b that volatility in the Sub-Saharan African sample is much higher for all the 15 variables included here than the level typically observed in developed countries.[11] Moreover, the volatility of the cyclical components obtained using the BP-filter is generally much lower than the standard deviations estimated when using the HP-filter. The BP-filter eliminates some of the high-frequency variation in the data, whereas the HP-filter only eliminates low-frequency variation. The estimated volatility in Table 6a and 6b is significantly lower than in an analysis where "standard" assumptions (i.e., using the eight year definition of the business cycle discussed in Sections 2 and 3) about the smoothing parameters are used. The relative volatility among the variables is more robust to changes in the smoothing parameter.[12]

---

[11] See Stock and Watson (1999) for detailed stylized facts of the US economy.

[12] Because the HP and BP filters used in this paper tend to eliminate more of the low-frequency variation than a first differencing procedure the standard deviations in Table 6a and 6b are generally lower than would be the case with a first differencing filter. However the ordering of countries by their cyclical volatility is similar.

During the period 1967-97, a number of empirical business cycle regularities can be identified for Sub-Saharan Africa. Output is generally much more volatile than that of industrialized countries. However the magnitude of the standard deviations of output in Sub-Saharan Africa is much less than that reported by Pallage and Robe (2001). They estimate that shocks to poor countries are about six times more severe than shocks to industrialized countries. Our result indicate that the volatility of output is only about 3-4 times that of developed countries. This highlights that the choice of smoothing parameter is indeed an important one.

Considering some of the other variables the highly volatile nature of private investment, money stock (M2), official development assistance (ODA) and credit to the private sector stand out. All of the variables mentioned have very high standard deviations relative to GDP. This reflects the evident vulnerability of African economies when it comes to exogenous factors as well as variables that can be affected more directly by policy.

Another characteristic in the data is that consumption is more volatile than output. This suggests that the consumption smoothing inherent in the permanent income hypothesis appears absent in Sub-Saharan Africa in contrast to empirical evidence available for the industrialized countries. It should be kept in mind, though, that the consumption figure documented here includes both consumption of services and consumption of durables. The latter is typically more volatile than GDP and other consumption indicators and is therefore considered separately when data for developed countries are analyzed with reference to the permanent income hypothesis. This is not possible here due the nature of the data available.

Table 6.a. *Standard deviations for Sub - Saharan Africa, HP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Benin	2.86	4.16	3.79	3.85	8.80	20.53	13.91	15.95	11.79	15.58	9.21	na	na	17.59	na
Burkina F	2.43	3.85	3.89	4.18	8.39	14.49	10.40	12.52	14.58	14.39	9.85	na	na	21.79	na
Burundi	3.56	3.83	4.71	4.65	13.27	24.60	8.43	11.15	na	13.07	24.89	6.59	5.05	23.04	na
Cameroon	4.28	6.44	6.65	7.27	7.65	11.43	9.41	10.71	9.41	20.18	13.69	na	na	16.61	na
Congo	4.17	5.44	5.35	6.55	21.89	24.70	17.76	15.96	na	22.74	14.50	na	76.51	na	na
C. dIvoire	3.73	7.37	5.92	6.00	8.04	22.11	9.28	8.86	15.76	20.37	16.99	14.04	4.80	16.69	na
Gabon	10.68	13.96	6.84	9.37	12.82	30.03	17.69	10.71	17.55	24.03	16.38	12.22	7.01	17.08	na
Gambia	2.57	8.20	8.16	9.17	9.33	16.51	11.93	12.76	11.05	27.13	12.18	7.55	7.57	16.89	na
Ghana	3.95	5.33	5.07	5.75	9.31	16.33	13.66	10.76	10.74	26.16	11.84	28.79	13.11	20.52	na
Kenya	3.94	6.00	6.50	7.85	4.19	14.97	12.11	5.67	11.95	14.59	9.88	7.14	6.93	13.92	na
Madagasc.	3.01	4.66	3.57	3.61	5.04	19.19	12.77	9.08	11.50	20.54	7.75	8.30	6.90	12.33	na
Malawi	3.88	5.72	4.79	7.46	7.93	19.88	11.02	8.88	8.58	17.51	9.04	na	na	20.18	na
Mali	4.15	4.22	4.47	4.65	9.97	10.98	9.81	6.86	14.51	17.86	6.81	na	na	21.35	na
Niger	6.18	8.95	9.05	11.17	9.86	35.43	13.43	14.10	16.87	18.84	12.98	11.11	6.26	18.95	na
Nigeria	4.41	7.62	8.33	8.92	14.69	15.57	13.53	13.75	17.17	24.56	17.51	19.02	9.13	18.17	na
Rwanda	11.41	6.87	7.26	6.84	23.02	15.21	13.73	18.78	11.63	14.27	20.30	na	na	20.17	na
Senegal	3.38	2.28	2.34	2.60	2.63	9.50	5.16	10.13	14.12	20.08	4.84	12.28	6.52	17.71	na
S. Africa	3.16	5.01	2.04	2.55	1.97	13.27	9.10	3.46	10.67	na	6.46	8.95	1.73	na	na
Zambia	2.43	6.85	7.06	13.00	18.75	12.73	11.21	8.31	na	25.90	19.04	na	na	na	na
Zimbabwe	5.10	4.95	7.60	9.55	12.26	14.19	Na	na	na	41.15	na	6.46	4.79	na	na

Notes: Gdp = Real gross domestic product, Abs = Real domestic absorption, Con = Real total consumption, Pco = Real private consumption, Pub = Real general government consumption, Inv = Real gross domestic investment, Imp = Real imports of goods and services, Exp = Real exports of goods and services, M2 = Nominal money and quasi money (M2), Oda = Official development assistance, Tot = Terms of trade index, Rer = Real effective exchange rate index, Cpi = Consumer price index, Cre = Private sector credit , Wag = Nominal wage index. Data sources include WDI (2000), GDF (2000), IDS (2000), IFS (2000) and Macro Time Series from www.worldbank.org/research/growth/

Table 6.b. *Standard deviations for Sub - Saharan Africa, BP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Benin	1.79	2.46	2.75	2.94	5.24	11.55	8.83	8.77	8.78	11.24	6.62	na	na	12.65	na
Burkina F	1.90	2.63	2.52	2.74	5.80	9.28	7.17	8.15	6.42	8.21	6.53	na	na	8.30	na
Burundi	2.46	2.63	3.35	3.41	9.08	19.78	5.52	9.36	na	8.76	17.22	4.20	3.01	14.47	na
Cameroon	2.90	4.25	4.33	4.70	4.98	7.21	6.33	7.29	4.62	13.20	11.30	na	na	9.41	na
Congo	1.75	2.73	2.28	3.25	17.16	19.20	9.98	8.47	na	11.79	9.59	na	34.03	na	na
C. dIvoire	1.96	3.86	3.30	3.25	5.04	14.07	5.43	5.34	7.87	12.99	8.26	7.42	2.50	9.09	na
Gabon	5.28	7.23	5.29	7.12	7.47	17.74	9.77	5.59	7.93	18.90	9.29	7.22	4.00	9.28	na
Gambia	1.54	3.18	3.23	3.59	4.37	8.63	4.33	5.31	6.61	18.56	6.82	4.24	3.16	11.79	na
Ghana	2.33	3.88	3.40	3.71	6.46	12.80	8.61	8.16	6.63	18.91	9.12	13.93	7.73	13.71	na
Kenya	2.14	3.09	4.14	4.92	2.51	10.62	7.33	4.50	6.17	6.91	6.10	4.46	3.01	8.10	na
Madagasc.	1.89	2.87	2.11	2.22	2.69	12.95	8.09	5.51	6.59	10.51	3.51	5.85	3.07	7.36	na
Malawi	2.66	4.19	3.74	5.86	5.01	14.89	8.06	6.72	4.72	11.04	5.18	na	na	8.10	na
Mali	2.56	2.62	2.91	3.02	7.16	7.00	6.53	5.11	8.02	10.65	4.29	na	na	14.25	na
Niger	3.54	5.96	6.81	8.13	5.38	23.53	8.66	11.32	7.24	13.13	9.00	6.38	3.70	9.71	na
Nigeria	2.98	4.47	5.57	5.93	9.62	8.38	7.68	8.30	9.84	15.45	12.54	10.87	5.65	11.89	na
Rwanda	8.08	4.49	4.54	4.22	15.83	11.05	9.60	14.03	6.13	9.91	14.06	na	na	15.33	na
Senegal	2.46	1.54	1.48	1.70	1.68	6.33	3.44	6.97	8.32	14.08	3.76	7.23	3.34	10.32	na
S. Africa	1.85	3.02	0.98	1.17	1.27	8.32	5.98	1.89	5.54	na	3.40	5.61	0.79	na	na
Zambia	1.69	4.19	4.56	7.78	10.73	8.83	7.25	5.85	na	16.22	13.29	na	na	na	na
Zimbabwe	2.41	2.32	4.16	5.40	8.43	7.79	na	na	na	25.78	na	3.62	2.19	na	na

Notes: See Table 6.a.

Turning now to analyzing cross correlations between GDP and other variables, Agénor, McDermott and Prasad (2000) define a series as pro-cyclical, a-cyclical, or counter-cyclical when the contemporaneous correlation coefficient is respectively positive, zero, and negative. In addition, the series is thought of as significantly contemporaneously correlated when $0.26 < |X| < 1.00$, where X represents the cross correlation coefficient between GDP and the other variable involved.

The relationship between business cycle fluctuations in aggregate output and the different components of aggregate demand is well documented for developed countries. This has not so far been the case for developing countries. From Table 7a and 7b it can be seen that there is a robust positive relationship between consumption, both total and private, and domestic output in Sub- Saharan African countries. The magnitude of the correlations is in line with that observed in industrialized countries, and there are few exceptions. Data from Gabon and Gambia point in the direction of counter-cyclical consumption, and Nigeria, Zambia and Zimbabwe show signs of a weaker relationship between consumption and output than documented for the rest of the region and the industrialized countries. The general picture is however clear.

There is also a strongly positive contemporaneous correlation between de-trended investment and GDP data in almost all the Sub-Saharan African countries, and this is independent of the type of filter used. This observation is not different from what is observed in industrialized countries, and indicates that investment and GDP are indeed positively related to each other. The only outlier is Kenya, where there is an insignificant negative correlation between investment and output when looking at the band pass filtered time series.

The relationship between government expenditure and GDP often attracts considerable attention, inter alia because of the desire to ensure that fiscal policies help stabilize the economy. We find indications of a positive relationship between government expenditure and output for most of the countries in the Sub-Saharan African sample. There is therefore no evidence of a counter-cyclical role of the government's fiscal policy in the present data, although some countries show signs of a negative relationship between government purchases and output. In contrast to the finding of Agénor, McDermott and Prasad (2000),

we would argue that fiscal policy needs reform before it is likely to have the desired contra-cyclical and stabilizing effect in Sub-Saharan Africa.

Turning next to the relationship between domestic business cycles and fluctuations in the variables relevant to international trade, Table 7a and 7b document a strongly positive relationship between imports and output in almost all of the Sub-Saharan African countries in our sample. In contrast, exports do not appear significantly correlated with the aggregate business cycle. This implies that foreign trade on balance would appear to be counter-cyclical, a characteristic also prevalent in developed countries. Exceptions include Nigeria where there are signs of a positive correlation between the trade balance and output, in all likelihood due to the substantial significance of oil exports in GDP. Another exception is Rwanda.

Focusing on the correlation between the terms of trade index and output, it is difficult to identify a general pattern for the countries studied here within the short-term framework of business cycle analysis. In industrialized countries it is common to find a positive correlation between lagged values of the terms of trade index and domestic output, and Agénor, McDermott and Prasad (2000) also report that the terms of trade are strongly related to output in their more limited sample, representing in particular middle-income countries. Our data do not support that terms of trade disturbances can in general explain business cycle fluctuations in output in Sub-Saharan African countries. Interestingly, for example South Africa and Nigeria are cases where a positive relationship can be identified. Yet, insignificant correlations are common and signs change when the filter applied changes. This puts the complexity of the terms of trade and output relationship in poor Sub-Saharan African countries into perspective and suggests that it is likely that quantity changes in imports and exports in response to price changes did indeed take place during the period under study. Nevertheless, responses clearly did differ from, for example, the first to the second oil crisis due to the difference in the availability of foreign exchange. All this therefore highlights that it is wise to study specific episodes and countries carefully before general conclusions are attempted, remembering that there are countervailing factors at work affecting respective the supply-side and the demand-side of the economy.

Monetary policy is often assigned a key role in stabilization programs in developing countries, and the relationship between monetary variables and the business cycle has become a topic of interest. A large literature has evolved around the question whether money causes output, and a positive correlation between money variables and output exists in industrialized countries. For Sub-Saharan African countries there are indications of this feature. Generally, the correlation between output and M2 is positive for a majority of the 20 African countries considered here, and this is so independent of the filter used. A Granger causality test shows some indication of causality going from money to output, but this result is very dependent on the choice of lags in the Granger causality procedure. Furthermore in a number of countries we also find evidence of the opposite causation from output to money. All in all we find little robust evidence for unidirectional Granger causality from M2 to output in the Sub-Saharan African sample. So it is difficult to say on this basis whether restrictive monetary policy may have had harmful real consequences or whether monetary policy does not seem to affect output. In any case, the pro-cyclical behavior of monetary aggregates should not be ignored as it does signal mutual interdependence.

Another monetary aggregate considered here is domestic private sector credit. Equity markets are weakly capitalized in most developing countries as compared with the industrialized countries, and this is so in particular in Sub-Saharan Africa. Private sector credit is therefore likely to play a critical role in determining investment and suggests that overall economic activity is influenced by domestic private sector credit. There is some indication of a pro-cyclical relationship between credit and output in the Sub-Saharan African region. The correlations peak as in Agénor, McDermott and Prasad (2000) at a zero lag, maybe indicating that the availability of domestic credit affects activity fairly rapidly. A Granger causality test indicates that it is very difficult to make a robust statement as regards the causality between private sector credit and output, as was the case for the other monetary aggregate M2. Regardless of the Granger causality test the positive association between private sector credit and domestic activity has important implications for the design of stabilization programs. Ignoring this link may exacerbate the output cost of a restrictive monetary policy aimed at lowering inflation.

A substantial literature documents the counter-cyclical behavior of prices in industrialized countries, and it is typically argued that this negative relationship provides support for

supply driven interpretations of the business cycle, including real business cycle models. The correlation between the consumer price index and output in our Sub-Saharan African sample is divided into two groups. Half the countries show pro-cyclical and half counter-cyclical behavior. Thus the African sample is not in accordance with the consistent negative pattern between output and prices in industrialized countries. It therefore appears that demand driven models of output should not be ruled out in the case of at least some African countries, whereas the supply-side is critical in others. This reinforces the point already made above about the need for careful attention to country specific circumstances and to countervailing forces at work (on both the demand and the supply-side of the economy) when for example a terms of trade shock hits.

The interpretation of the unconditional correlation between output and measures of the real effective exchange rate (REER) is complicated. The short run relationship depends crucially on the sources of the macroeconomic fluctuations. Nonetheless, unconditional correlations may be useful for two reasons. First, the signs and magnitude of these correlations could give an indication of the types of shocks that have dominated fluctuations over a period of time. Second, the correlations could help in interpreting the correlation between output and other trade related variables. In our sample, a clear picture does not emerge when examining the cross correlation between REER and output. Some countries provide evidence for a positive relationship and some show a generally negative correlation. However, in many cases the correlations are not significantly different from zero. This absence of a systematic relationship between REER and the business cycle is consistent with the result obtained when analyzing industrialized and middle-income countries, and it implies that policy analysis related to business cycles should not overemphasize the effects of REER on the economy.

The correlation between Official Development Assistance (ODA) and GDP is also documented in Table 7a and 7b. Pallage and Robe (2001) show that for a majority of the Sub-Saharan African countries aid flows are pro-cyclical.[13] This finding is not supported by our analysis. Pallage and Robe (2001) note the magnitude of output fluctuations

[13] Pallage and Robe (2001) base their analysis on both ODA commitments and disbursements. They generally find that commitments are ”less clearly” pro-cyclical than disbursements. We find that commitments are either counter-cyclical or at least do not provide any evidence for being pro-cyclical. As regards disbursements we find that commitments and disbursements are highly correlated. Since commitment data are generally more reliable and better sourced than disbursements, we find it justified to rely on the former in the present analysis.

experienced by African countries, and this may clearly be an important handicap for economic growth. They further argue that the existence of strongly pro-cyclical aid flows underpin the suggestion that aid may be harmful to growth in the African context. The cyclical nature of aid flows is therefore of interest. From our analysis (where appropriate filters are applied) it emerges that it is only in Congo that aid has been significantly pro-cyclical. In other countries the correlation is either statistically insignificant or aid is counter-cyclical.

Table 7.a. *Cross correlations for Sub - Saharan Africa, HP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Benin	1.00	0.75	0.67	0.61	0.41	0.26	0.52	0.56	-0.08	-0.41	-0.11	na	na	-0.09	na
Burkina F	1.00	0.80	0.66	0.61	0.38	0.42	0.34	-0.10	0.19	0.14	0.09	na	na	0.27	na
Burundi	1.00	0.87	0.66	0.60	0..38	0.35	0.06	0.01	na	-0.03	0.20	-0.34	-0.34	0.17	na
Cameroon	1.00	0.79	0.72	0.71	0.29	0.58	0.42	0.08	-0.02	-0.29	0.10	na	na	-0.03	na
Congo	1.00	0.94	0.87	0.81	0.01	0.37	0.82	0.59	na	0.53	0.11	na	-0.58	na	na
C. dIvoire	1.00	0.87	0.83	0.75	0.83	0.61	0.60	-0.47	0.58	0.02	0.49	0.36	0.32	0.35	na
Gabon	1.00	0.95	0.08	-0.27	0.70	0.88	0.84	0.72	0.47	-0.11	0.16	-0.13	0.31	0.24	na
Gambia	1.00	-0.18	-0.21	-0.18	-0.29	0.23	0.06	0.59	-0.01	-0.27	-0.39	-0.07	0.23	0.10	na
Ghana	1.00	0.87	0.90	0.87	0.25	0.34	0.52	0.23	0.35	0.17	0.05	-0.30	-0.10	0.27	na
Kenya	1.00	0.72	0.83	0.86	0.03	0.19	0.24	-0.18	0.40	0.37	-0.18	0.35	-0.46	0.50	na
Madagasc.	1.00	0.94	0.83	0.82	0.65	0.84	0.71	0.47	0.14	0.36	-0.15	-0.01	-0.23	0.30	na
Malawi	1.00	0.74	0.82	0.75	-0.10	0.22	0.35	0.29	0.45	0.10	0.10	na	na	0.18	na
Mali	1.00	0.88	0.81	0.80	0.29	0.41	-0.01	0.40	0.23	-0.27	0.62	na	na	-0.00	na
Niger	1.00	0.77	0.67	0.60	0.43	0.55	0.17	0.09	0.45	0.06	0.13	0.26	0.04	0.35	na
Nigeria	1.00	0.28	0.26	0.30	-0.06	0.22	0.16	0.66	0.13	0.23	0.12	-0.17	-0.16	0.07	na
Rwanda	1.00	0.91	0.88	0.75	0.74	0.37	-0.24	0.77	0.54	-0.74	-0.19	na	na	0.35	na
Senegal	1.00	0.83	0.63	0.64	0.10	0.61	0.43	0.79	0.13	-0.28	-0.32	0.09	0.26	-0.10	na
S. Africa	1.00	0.99	0.84	0.83	0.20	0.95	0.95	-0.22	0.57	na	0.24	0.28	-0.02	na	na
Zambia	1.00	0.41	0.36	0.34	-0.18	0.32	0.11	-0.08	na	-0.26	0.07	na	na	na	na
Zimbabwe	1.00	0.93	0.33	0.28	0.20	0.52	na	na	na	0.32	na	0.03	-0.52	na	na

Notes: See Table 6.a.

Table 7.b *Cross Correlations for Sub - Saharan Africa, BP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Benin	1.00	0.78	0.62	0.70	-0.08	0.16	0.46	0.54	-0.20	-0.50	0.05	na	na	-0.19	na
Burkina F	1.00	0.75	0.57	0.51	0.35	0.55	0.19	-0.08	-0.08	0.21	-0.18	na	na	0.03	na
Burundi	1.00	0.85	0.62	0.59	0.24	0.39	-0.13	-0.08	na	-0.19	0.31	-0.20	-0.37	0.32	na
Cameroon	1.00	0.74	0.66	0.68	0.10	0.62	0.27	0.04	0.17	-0.11	-0.01	na	na	0.07	na
Congo	1.00	0.88	0.71	0.42	0.13	0.43	0.68	0.30	na	0.31	0.06	na	-0.14	na	na
C. dIvoire	1.00	0.81	0.76	0.67	0.76	0.49	0.22	-0.53	0.18	-0.31	0.37	-0.02	-0.13	-0.03	na
Gabon	1.00	0.92	0.03	-0.16	0.53	0.80	0.61	0.42	0.26	-0.22	0.22	-0.25	0.13	-0.00	na
Gambia	1.00	-0.08	-0.10	-0.08	-0.21	0.06	0.01	0.44	-0.04	-0.16	-0.17	-0.01	0.13	0.12	na
Ghana	1.00	0.90	0.90	0.87	0.30	0.55	0.64	-0.11	0.12	-0.17	-0.03	-0.10	0.06	0.21	na
Kenya	1.00	0.60	0.76	0.76	0.33	-0.07	0.05	-0.10	0.12	0.02	-0.02	0.16	-0.19	0.08	na
Madagasc.	1.00	0.94	0.84	0.82	0.50	0.79	0.68	0.43	0.21	0.19	-0.17	0.28	-0.10	0.58	na
Malawi	1.00	0.71	0.78	0.76	-0.26	0.18	0.26	0.18	0.57	-0.04	0.07	na	na	0.15	na
Mali	1.00	0.85	0.78	0.77	0.17	0.32	-0.10	0.18	0.17	-0.25	0.53	na	na	0.05	na
Niger	1.00	0.74	0.70	0.65	0.49	0.44	0.05	-0.19	0.04	0.38	0.15	-0.23	-0.12	0.23	na
Nigeria	1.00	0.23	0.08	0.15	-0.24	0.22	0.14	0.66	0.17	-0.01	0.30	0.07	-0.17	0.01	na
Rwanda	1.00	0.92	0.88	0.70	0.81	0.53	-0.30	0.72	0.74	-0.75	-0.25	na	na	0.44	na
Senegal	1.00	0.81	0.66	0.65	0.11	0.55	0.14	0.71	0.14	-0.33	-0.45	0.18	0.20	-0.05	na
S. Africa	1.00	0.99	0.81	0.78	0.33	0.97	0.95	-0.21	0.37	na	0.24	0.11	-0.13	na	na
Zambia	1.00	0.25	0.24	0.35	-0.36	0.26	-0.10	-0.04	na	-0.48	0.11	na	na	na	na
Zimbabwe	1.00	0.86	0.32	0.28	0.10	0.54	na	na	na	0.16	na	-0.35	-0.58	na	na

Notes: See Table 6.a.

(b) *Latin America*

In Table 8a and 8b we document the set of stylized business cycle facts covering 15 indicators in 15 Latin American countries during the period 1967-97. Our summery statistics show (in contrast to those of Pallage and Robe, 2001, but in line with for example those of Agénor, McDermott and Prasad, 2000) that GDP for most of the countries in this region is not more volatile during the business cycle than what is typically observed in industrialized countries. While mechanisms for stabilizing business cycle fluctuations may well be weaker in Latin America than in industrialized countries, we argue that this cannot be concluded from GDP data only.

Turning to consumption, both total and private consumption are generally more volatile than output. This is opposite to what is observed in developed countries, but it is in line with the data for Sub-Saharan Africa that – as discussed above – indicate that the

permanent income hypothesis is unlikely to hold. It would therefore appear that also in Latin America there are difficulties in smoothening consumption during the business cycle. Investment patters, however, seem more in line with what is documented for industrialized countries. The relative volatility between investment and output in our sample is about two to five, a range that corresponds well with what has been found in developed countries.[14]

Another Latin American business cycle characteristic is that money supply is highly volatile, as is the case in developing countries more generally. The standard deviation of M2 in Latin American countries appears a little higher than what is observed in the other regions analyzed in this paper. One likely cause for this is that seignorage is a much more important source of government income in developing countries during recession periods than in industrialized countries. The M2 indicator is therefore not geared as closely to the stabilization objective as in developed countries.

Official development assistance is highly volatile in Latin America. The average standard deviation across countries is even higher than in Sub-Saharan Africa. This is in accordance with Pallage and Robe (2001). Given the relatively small size of ODA relative to GDP in Latin America, it would appear that the impact of ODA volatility should in all likelihood not be overemphasized.

Finally, it is well known that many countries in Latin America experienced hyperinflation during the period under study. This is also reflected in our data. Standard deviations in Argentina, Bolivia, Chile and Peru stand out with particularly large fluctuations when analyzing this cyclical component. The inflation characteristic is clearly an indicator where Latin America is different.

14 The exact magnitude of the relative volatility depends crucially on the investment measure used.

Table 8.a. *Standard deviations for Latin America, HP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Argentina	4.29	5.64	4.98	na	na	11.61	20.86	8.20	28.97	27.23	7.20	29.12	72.09	20.89	na
Bolivia	2.34	2.95	2.43	na	4.18	11.76	10.45	9.02	23.56	16.91	na	8.20	88.69	16.22	na
Brazil	3.32	3.68	2.48	3.31	7.44	9.00	8.48	6.43	21.27	61.62	8.51	na	na	29.59	na
Chile	5.12	9.09	8.50	9.77	3.59	20.67	16.68	7.57	29.25	128.93	11.52	15.57	39.85	25.81	na
Columbia	1.47	2.39	1.47	1.38	4.50	7.54	9.84	6.58	7.37	26.62	7.80	5.55	3.44	na	na
Dom Rep.	2.45	3.71	5.06	4.13	11.79	10.15	13.28	11.22	15.12	79.58	8.83	12.54	9.28	16.28	na
Ecuador	3.44	3.37	2.31	1.72	6.80	9.34	8.10	15.39	11.04	20.66	12.64	7.58	7.80	14.36	na
El Salvad.	4.16	5.99	5.14	5.90	9.01	13.59	10.94	10.07	5.55	15.27	13.93	7.81	4.11	8.41	na
Guatamala	2.00	2.57	1.84	1.80	3.80	11.48	10.41	5.88	9.83	18.85	6.67	7.06	6.81	11.22	na
Haiti	3.52	4.33	3.77	na	na	13.96	15.52	20.27	8.78	35.61	14.61	9.20	6.80	16.77	na
Honduras	2.90	4.54	3.09	3.24	6.00	15.27	8.43	5.97	6.68	18.97	7.77	8.31	4.89	8.33	na
Mexico	2.92	4.87	3.34	3.52	2.40	11.26	17.51	5.81	24.48	35.83	8.64	11.29	15.10	29.07	13.63
Paraguay	3.41	6.69	6.29	6.76	11.04	11.68	19.89	13.94	14.98	21.64	15.16	10.02	5.47	16.23	na
Peru	5.32	8.04	5.71	5.66	7.69	21.20	12.81	6.91	17.70	18.02	10.32	12.91	86.85	20.10	na
Uruguay	4.55	6.92	5.67	6.32	4.55	15.62	11.28	6.27	20.74	37.45	9.78	13.73	13.65	20.55	na

Notes: See Table 6.a.

Table 8.b. *Standard deviations for Latin America, BP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Argentina	2.71	3.42	2.89	na	na	6.78	11.15	5.14	17.02	19.58	4.54	17.71	32.26	12.34	na
Bolivia	0.87	1.55	1.16	na	2.59	7.29	5.70	5.29	10.98	12.27	na	5.91	36.19	11.62	na
Brazil	1.60	1.77	1.60	2.11	4.25	4.07	4.98	4.65	13.26	49.57	4.70	na	na	20.15	na
Chile	2.54	4.61	4.67	5.37	2.22	13.78	8.59	4.47	12.81	95.26	6.92	9.05	12.10	11.46	na
Columbia	0.62	1.09	0.62	0.62	2.45	3.88	4.24	3.79	3.37	18.53	5.38	2.77	1.52	na	na
Dom Rep.	1.51	2.60	3.80	3.26	6.99	6.89	8.32	7.76	12.36	62.34	6.58	8.67	4.58	12.68	na
Ecuador	2.06	2.01	1.03	0.78	3.63	7.07	5.58	8.08	6.34	13.36	8.56	4.05	3.53	5.82	na
El Salvad.	1.51	2.49	2.17	2.76	5.41	8.19	5.49	7.27	2.10	10.61	9.44	5.65	2.01	4.69	na
Guatamala	0.82	1.41	0.77	0.74	2.33	8.17	6.49	3.46	6.40	9.55	4.22	4.72	3.60	7.28	na
Haiti	2.08	3.08	2.92	na	na	8.13	11.70	13.63	4.81	21.50	8.59	4.86	3.05	7.18	na
Honduras	1.49	2.55	1.95	2.15	3.59	9.38	4.77	3.57	3.73	13.96	4.63	5.71	2.54	3.89	na
Mexico	1.45	2.55	1.57	1.69	1.36	6.67	9.09	2.57	11.08	25.42	4.89	7.20	6.64	15.74	5.72
Paraguay	1.44	4.41	4.67	5.24	6.34	6.18	13.81	9.63	5.80	15.80	12.13	7.21	2.78	6.15	na
Peru	2.80	4.23	2.88	2.94	4.15	10.50	7.03	4.78	10.45	11.70	7.30	7.06	32.15	10.68	na
Uruguay	1.85	2.84	2.53	2.83	3.31	6.02	4.90	3.37	8.85	22.86	5.82	7.22	5.45	10.83	na

Notes: See Table 6.a.

Analyzing second moments for the Latin American sample (Table 9a and 9b) shows that all countries in the sample, except Ecuador, have positive correlations between output, on the one hand, and total and private consumption, on the other, and signs are not that

different when compared to developed countries. Ecuador shows signs of counter-cyclical consumption when considering the BP-filtered time series, but Ecuador is an outlier when considering almost any of the indicators analyzed here.

The correlation between government expenditure and GDP is positive, a relatively robust result across the sample. The counter-cyclical government role when it comes to government expenditure is not present in the Latin American data, in line with results obtained when analyzing developed countries.

Investment is strongly, and positively correlated with GDP for all countries in the Latin American sample (except Ecuador), a finding similar to that of developed countries. It is not documented here, but the correlation between investment and output peaks at time zero for almost all countries in the sample. This finding is identical to what is observed for the US economy, but in European countries this correlation peaks with a lag. When building applied models, this is critical for the choice of discount rates and demonstrates the importance of deriving stylized facts as argued by Lucas (1981).

Indicators concerning international trade in the Latin American sample show that the trade balance can in general be thought of as counter-cyclical. Imports are significantly pro-cyclical for most of the countries considered, reflecting that economic activity in small open economies is generally import-dependent. Exports for most of the countries in the sample are also pro-cyclical. This is in contrast with industrialized countries, and may well reflect export promotion policies in Latin America in the later part of the period studied here. Notable exceptions are Ecuador, Guatemala, and Haiti, with Ecuador showing signs of strongly pro-cyclical behavior of the trade balance.

Generally, one would expect positive correlation between the terms of trade and GDP. While there is some indication hereof in the Latin American sample it is far from robust. Ecuador stands out again together with Haiti with a significant and negative relationship. However, for at least six countries (Brazil, Chile, Mexico, Paraguay, Honduras, and the Dominican Republic) in the sample terms of trade disturbances seem to have contributed significantly to business cycle fluctuations in the respective countries. Argentina is almost in this group. Yet, the level of significance is nevertheless just below the level of 0.26 used here. The real effective exchange rate (REER) also shows signs of a positive

relationship, indicating that the exchange rate tends to appreciate when the cyclical component of output goes up. Nevertheless, in nine out of the 15 countries in the sample the sign is insignificant. This reflects that the short run effects of REER fluctuations depends on the exchange rate arrangement in the individual countries that also vary over time, and it is difficult in the present data to derive general region specific conclusions about the effects of REER on output fluctuations.

The correlation between money and output is generally positive in Latin America, independent of the filter used. This result is in line with results obtained for developed countries. The issue whether money causes output or vice versa continues to loom in the background. A situation where the pattern of lead and lag correlations shows positive correlation between money and output that peaks with a lag is sometimes interpreted as an indication of the speed with which changes in the monetary policy is transmitted to real activity. In the Latin American countries these peak positive correlations occur with no or only one lag. This indicates a short transmission period of monetary shocks to real output. And Granger-causality tests provide some evidence that money Granger-causes output, although the result is not unidirectional.

Another monetary aggregate to be considered is domestic private credit. In Latin America there seems to be a fairly strong positive relationship between private credit and output, where the correlations peak at time zero. This might reflect the speed with which changes in domestic sector credit impacts on economic activity. Agénor, McDermott and Prasad (2000) did Granger-causality tests to measure whether private sector credit has any predictive power on industrial output. They found that for some countries domestic private credit can predict output fluctuations in a Granger-causal sense. This is confirmed in our data, but the robustness of the result is questionable. All in all, the general positive link between domestic private credit and output in Latin America should certainly be kept in mind when designing stabilization programs.

Traditional Keynesian models in which nominal wages are fixed have over the past three decades been heavily criticized by new classical theory. Moreover, data for industrialized countries do seem to indicate that real wages are pro-cyclical in contrast to the prediction

of the traditional Keynesian approach.[15] A priori we would expect the nominal wage index to exhibit a pattern similar to that of the CPI due to, for example, contractual indexing of wages. However, wage indexation data are extremely scarce in our sample. In Mexico for which we do have information both nominal wages and prices are strongly counter-cyclical, and the correlation between real wages and output is positive. The traditional Keynesian model does not seem to stand up based on our data. Mexican data also show - like in most other countries in the region - a negative relationship between CPI and GDP. This suggests that a supply driven model may be the more appropriate choice as in the case of industrialized countries. On the other hand, general regional specific statements are not feasible due to the lack of data.

Finally, the correlation between ODA and GDP documented for Latin America in Table 9a and 9b shows no pattern. Most correlations are insignificant, and only Honduras has a significant correlation (negative) when both filters are considered. There is no support in our data for concluding that ODA is pro-cyclical in Latin America.

Table 9.a. *Cross Correlations for Latin America, HP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Argentina	1.00	0.99	0.93	na	na	0.88	0.83	-0.53	0.74	0.05	0.23	0.44	-0.52	0.36	na
Bolivia	1.00	0.64	0.73	na	0.47	0.46	0.36	0.45	0.25	0.23	na	0.16	-0.25	0.22	na
Brazil	1.00	0.99	0.84	0.82	0.63	0.92	0.70	0.08	0.50	0.04	0.37	na	na	-0.05	na
Chile	1.00	0.97	0.91	0.91	0.63	0.63	0.93	0.16	0.69	0.18	0.58	0.61	-0.51	0.64	na
Columbia	1.00	0.64	0.87	0.84	0.40	0.35	0.35	0.54	0.30	-0.04	-0.07	0.21	-0.24	na	na
Dom Rep.	1.00	0.85	0.61	0.62	0.03	0.66	0.55	0.34	0.19	0.05	0.40	-0.12	-0.54	0.27	na
Ecuador	1.00	0.10	0.10	0.13	0.03	0.11	0.04	0.85	0.26	0.02	-0.44	0.29	0.16	0.04	na
El Salvad.	1.00	0.91	0.90	0.82	0.36	0.73	0.84	0.41	0.40	-0.45	0.43	0.06	0.12	0.24	na
Guatamala	1.00	0.84	0.94	0.96	0.47	0.50	0.69	0.72	0.03	0.15	0.05	-0.12	0.31	0.12	na
Haiti	1.00	0.81	0.75	na	na	0.63	0.67	0.81	0.57	-0.30	-0.49	0.38	-0.31	0.41	na
Honduras	1.00	0.76	0.65	0.64	0.26	0.62	0.64	0.61	0.37	-0.25	0.43	0.11	-0.43	0.24	na
Mexico	1.00	0.96	0.97	0.97	0.70	0.89	0.84	0.16	0.89	0.29	0.86	0.75	-0.68	0.88	-0.51
Paraguay	1.00	0.74	0.52	0.47	0.40	0.85	0.56	0.14	0.41	-0.10	0.09	0.06	0.49	0.51	na
Peru	1.00	0.93	0.86	0.87	0.64	0.70	0.69	-0.13	0.30	-0.40	0.08	0.11	-0.70	0.17	na
Uruguay	1.00	0.96	0.91	0.90	0.55	0.89	0.89	0.24	0.67	0.56	0.21	0.75	0.28	0.58	na

Notes: See Table 6.a.

15 New-Keynesian business cycle models exhibiting monopolistic competition in both commodity and labor markets have in recent years been developed to capture the pro-cyclical nature of real wages (see Benhabib and Farmer (1994 and 1996).

Table 9.b. *Cross Correlations for Latin Americ, BP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Argentina	1.00	0.99	0.95	na	na	0.90	0.84	-0.49	0.60	0.14	0.20	0.38	-0.55	0.39	na
Bolivia	1.00	0.52	0.48	na	0.50	0.42	0.17	0.14	0.10	-0.21	na	0.17	-0.08	0.06	na
Brazil	1.00	0.97	0.78	0.73	0.42	0.78	0.47	-0.02	0.18	-0.09	0.25	na	na	-0.06	na
Chile	1.00	0.94	0.86	0.86	0.53	0.33	0.88	0.39	0.42	0.05	0.32	0.44	-0.27	0.48	na
Columbia	1.00	0.58	0.75	0.77	0.01	0.40	0.34	0.34	0.41	0.06	0.03	0.13	-0.39	na	na
Dom Rep.	1.00	0.83	0.55	0.56	-0.18	0.66	0.51	0.15	0.28	0.04	0.26	0.16	-0.50	0.27	na
Ecuador	1.00	-0.09	-0.08	0.10	-0.24	-0.03	-0.29	0.86	0.22	-0.16	-0.44	0.23	-0.05	-0.01	na
El Salvad.	1.00	0.69	0.68	0.59	0.11	0.34	0.67	0.45	0.20	-0.12	-0.02	0.09	-0.20	0.05	na
Guatemala	1.00	0.76	0.88	0.93	0.25	0.47	0.61	0.45	0.26	-0.09	0.15	0.16	-0.11	0.38	na
Haiti	1.00	0.79	0.74	na	na	0.52	0.67	0.75	0.44	-0.22	-0.42	0.42	0.08	0.27	na
Honduras	1.00	0.61	0.55	0.56	0.06	0.41	0.40	0.49	0.52	-0.30	0.07	0.24	-0.53	0.38	na
Mexico	1.00	0.97	0.95	0.94	0.61	0.93	0.85	-0.25	0.82	0.04	0.71	0.70	-0.55	0.82	-0.37
Paraguay	1.00	0.60	0.43	0.41	0.11	0.69	0.32	-0.40	-0.19	0.02	0.31	-0.25	0.33	-0.10	na
Peru	1.00	0.92	0.86	0.85	0.57	0.75	0.75	0.04	0.15	-0.14	0.08	0.28	-0.42	0.07	na
Uruguay	1.00	0.93	0.92	0.90	0.32	0.74	0.75	0.17	0.48	0.25	0.13	0.52	0.21	0.29	na

Notes: See Table 6.a.

(c) *Asia and North Africa*

Turning to the analysis of the standard deviations for the Asian and North African countries, Table 10a and 10b show that the volatility in GDP is generally not significantly different for what is observed in developed countries. The data analysis also shows that a downward adjustment in the standard deviations for Asian countries, when using the BP-filter instead of the HP-filter, is more pronounced than for North African countries. This highlights once again the importance of using appropriate filters before drawing any final conclusions about business cycle properties of a particular country.

In the Asian and North African group of countries some can be thought of as behaving in accordance with the permanent income hypothesis. Half have standard deviations in both total consumption and private consumption that are less volatile than GDP. The consumption volatility in the Philippines for example is only half of the standard deviation in GDP. For this group of countries it therefore generally seems as if business cycle consumption patterns are better in accordance with patterns in industrialized

countries than in the other developing regions studied in this paper. Moreover, the relative volatility in investment to GDP also follows that of the developed countries. The standard deviation in investment is two to five times the volatility in GDP.

Money aggregates also seem to be relatively well in concordance with the stylized facts of industrialized countries. M2 is a bit more volatile than what is observed in industrialized countries, but the standard deviation of this indicator is lower than in other developing countries. Concerning private credit, only India stands out significantly with reported standard deviations of 45.35% (HP) and 35.12% (BP), respectively. The rest of the Asian and North African countries have low standard deviations as compared to other developing countries.

The volatility in the CPI follows the above pattern. The documented figures are above what is observed in developed countries, but below what is seen in other developing countries. The volatility in wages is documented for two countries (Korea and Sri Lanka) and there is no significant indication whether wages are more or less volatile than consumer prices. It would seem that these indicators have quite similar business cycle properties. Effective contractual indexing of nominal wages to the consumer price index could lead to a situation where the business cycle features of wages closely follow that of the CPI.

Finally, the volatility of ODA in this group of countries is also very high as was the case in Latin America. However, it is once again important to keep in mind the relatively minor significance of ODA as a share of GDP in the countries included in the present Asian and North African sample.

All in all, the business cycle properties of the present sample with regard to volatility do not deviate much from the summery statistics in industrialized countries.

Table 10.a. *Standard deviations for Asia and North Africa, HP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Algeria	3.55	3.96	3.29	3.40	4.78	7.42	10.14	6.56	10.59	18.11	16.52	na	na	24.69	na
Bangladesh	3.67	4.17	4.80	4.83	4.68	16.58	17.80	11.71	na	na	17.03	na	10.59	na	na
China	2.94	4.11	2.66	2.56	4.89	7.87	16.16	9.51	na	na	4.90	na	na	na	na
Egypt	2.57	3.10	2.19	na	na	11.74	7.34	6.85	6.76	36.88	10.67	19.18	2.16	13.10	na
India	2.34	2.48	na	na	3.87	5.42	na	na	6.65	20.88	7.32	6.09	5.13	45.35	na
Indonesia	1.33	3.91	4.51	5.27	4.69	5.56	7.73	6.05	9.22	16.92	10.01	9.05	5.37	16.15	na
Korea	2.50	3.00	1.85	2.14	2.25	9.19	6.32	7.22	8.80	122.00	3.58	5.83	4.94	9.17	5.84
Malaysia	2.30	6.16	4.25	4.84	4.56	11.43	9.46	3.92	6.16	42.25	5.55	5.14	2.94	10.49	na
Morocco	2.81	4.72	3.59	3.10	8.54	13.81	9.74	6.90	9.56	31.94	5.26	7.99	2.30	na	na
Pakistan	1.62	3.58	2.62	3.22	5.46	2.99	12.13	9.17	11.45	22.35	10.46	10.00	4.54	11.71	na
Papua N.G.	4.17	5.28	3.54	4.22	3.83	19.17	8.98	10.81	na	11.10	8.76	na	na	na	na
Philippines	3.37	4.63	1.78	1.60	4.39	13.10	9.81	7.79	7.91	23.27	5.69	7.27	6.47	15.93	na
Sri Lanka	1.35	3.30	3.44	3.92	6.51	10.72	7.51	4.94	7.25	13.05	12.00	8.37	4.64	7.41	7.05
Thailand	2.14	3.96	1.96	2.10	3.67	8.40	9.97	5.66	4.05	17.14	6.59	4.13	4.40	7.99	na
Tunisia	2.33	3.16	1.99	2.18	2.76	10.00	5.83	6.46	6.48	19.67	8.57	na	na	6.31	na

Notes: See Table 6.a.

Table 10.b. *Standard deviations for Asia and North Africa, BP, percent*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Algeria	2.84	2.67	2.23	2.41	3.32	4.90	6.59	5.36	6.90	12.16	10.65	na	na	14.89	na
Bangladesh	2.41	2.74	3.47	3.49	3.29	11.96	13.47	9.30	na	na	13.12	na	3.95	na	na
China	1.52	2.18	1.23	1.24	2.47	4.48	9.38	4.82	na	na	2.55	na	na	na	na
Egypt	1.21	1.96	1.32	na	na	5.86	4.70	3.97	3.67	28.39	4.97	8.76	1.36	7.31	na
India	1.50	1.69	na	na	1.70	4.10	na	na	3.07	15.73	5.38	3.46	2.70	35.12	na
Indonesia	0.84	2.26	2.88	3.45	3.37	2.37	4.53	3.89	5.46	7.81	6.06	4.64	2.57	9.77	na
Korea	1.37	1.69	0.99	1.22	1.28	5.51	3.93	4.84	4.26	78.51	2.04	2.49	2.33	4.39	1.96
Malaysia	1.28	2.83	1.84	2.27	2.22	6.19	5.51	2.96	2.95	27.67	4.52	2.68	1.35	6.07	na
Morocco	2.05	2.56	2.27	2.38	4.07	8.73	5.15	5.15	4.26	21.52	3.21	3.70	1.33	na	na
Pakistan	1.13	2.44	1.93	2.39	4.00	2.02	7.70	6.30	5.57	15.45	7.17	6.22	1.87	5.91	na
Papua N.G.	1.96	2.91	2.07	2.57	3.10	10.49	5.53	4.72	na	7.71	6.60	na	na	na	na
Philippines	1.43	2.03	0.62	0.54	2.06	6.71	3.90	5.04	3.76	15.52	3.62	4.48	4.17	6.88	na
Sri Lanka	0.74	1.88	2.01	2.45	4.18	6.84	3.99	3.73	5.29	9.09	7.17	4.78	2.09	6.07	4.03
Thailand	0.99	2.36	0.96	1.06	1.96	5.39	6.20	3.06	2.08	10.51	5.00	2.36	2.04	3.66	na
Tunisia	1.78	1.84	1.40	1.62	1.27	5.90	3.17	3.82	3.20	9.66	4.66	na	na	3.48	na

Notes: See Table 6.a.

The contemporaneous correlations between GDP and the 14 other variables in this study are documented in Table 11a and 11b for the 15 Asian and North African countries. Except for Egypt there is significant positive correlation between output and total as well as private consumption. Correlations are generally as high as documented for the US and

European countries. As regards the stabilizing (counter-cyclical) impact of government consumption there is no clear picture, and for three countries the sign of the correlation changes from one filtering procedure to the other.

For most countries in the Asian and North African sample there is indication of a positive and significant relationship between gross domestic investment and output. This is independent of the filter used and corresponds well with what is observed in industrialized countries. Besides Egypt, the only other countries with atypical characteristics are Papua New Guinea and Sri Lanka where the signs of contemporaneous correlations change, depending on the filter used.

As regards the trade balance and output, our data do not provide a clear counter-cyclical picture for the Asian and North African group. This is as discussed above in contrast with the relationship in industrialized countries. Imports are, with the exception of Egypt, positively correlated with output. However, exports are also highly positively correlated with GDP, a feature that is not observed at this level in any developed countries. Export promotion policies are in all likelihood one dimension of the underlying features captured in this relationship. Looking at the terms of trade variable only two countries in the sample show signs of a significantly positive time-series correlation with output, independent of the filter applied. Terms of trade disturbances may, in other words, not have been quite as an important source behind general output fluctuations in Asia and North Africa as found by Hoffmeister and Roldos (1997) for Asia and Latin America. Finally, it is difficult to identify any pattern in the relationship between the REER for Asian and North African countries and output. Given the different exchange rate regimes in place this result is not surprising, and generally corresponds well with what is observed in developed countries.

The contemporaneous correlations between money and GDP suggest that for most of the countries in the Asia/North Africa sample money is pro-cyclical. The only exceptions are Morocco, Pakistan and Sri Lanka, when BP-filtered series are used. This again highlights the potential importance of money when macroeconomic fluctuations of the business cycle are under study. Our result is different from that of Agénor, McDermott and Prasad (2000). They identify limited evidence in their sample of mainly middle-income countries for pro-cyclical behavior of monetary aggregates. But it should be mentioned that a

bivariate Granger-causality test provides no clear picture of whether M2 can be used for predicting output. Turning to private sector credit there are also signs of a positive relationship with output. This might indicate that credit has some predictive power when trying to explain output fluctuations, but it could also be that the demand for loans is determined by a set of other factors jointly determining credit and output. We recognize that the two monetary aggregates considered here do not have the power to predict output fluctuations in the Granger-causality sense. Yet, it is striking that so many countries show significant positive correlations between output and monetary aggregates. It would certainly appear justified to include monetary variables when modeling business cycles in developing countries as long as it appears that money has real side effects in the business cycle.

Negative correlations between the CPI and GDP in combination with nominal wages, which are uncorrelated with GDP in Korea, provide no support for the wage indexing hypothesis already referred to above. Data from Sri Lanka indicate the exact opposite result with correlations for CPI and the wage index being almost identical. This is regardless of the filter used. In sum, it would appear that a supply-side approach to economic analysis with marginal productivity of labor equaling the real wage is more appropriate in Korea than in Sri Lanka where real wages and output are approximately uncorrelated. The lack of correlation in Sri Lanka can be explained with reference to an efficiency wage-setting environment (see for example Danthine and Donaldson, 1990). With reference, more specifically, to consumer prices in the Asian and North Africa group no clear pattern seems to exist between CPI and GDP, which is contrary to results documented for industrialized countries. Demand-driven models should not be ruled out a priori when studying business cycles in developing countries.

Finally, no cyclical pattern between ODA and output in Asia and North Africa is evident in our data, the only exception being Thailand. This result modifies the Pallage and Robe (2001) conclusion that aid commitments are not counter-cyclical. We cannot rule out that this may be so in the Asian and North African countries in our sample.

Table 11.a. *Cross Correlations for Asia and North Africa, HP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Algeria	1.00	0.46	0.30	0.34	0.10	0.45	0.37	0.91	0.21	-0.20	0.02	na	na	0.19	na
Bangladesh	1.00	0.95	0.76	0.76	0.65	0.61	0.49	0.40	na	na	0.27	na	-0.02	na	na
China	1.00	0.94	0.75	0.75	0.50	0.88	0.54	0.14	na	na	-0.02	na	na	na	na
Egypt	1.00	0.15	0.34	na	na	-0.00	-0.11	0.66	0.05	-0.11	-0.14	0.06	0.18	0.24	na
India	1.00	0.95	na	na	0.42	0.56	na	na	0.13	-0.21	0.25	0.05	-0.19	0.08	na
Indonesia	1.00	0.46	0.33	0.28	0.34	0.49	0.31	0.18	0.23	0.16	0.47	-0.04	0.11	-0.14	na
Korea	1.00	0.89	0.64	0.69	0.02	0.80	0.78	0.47	0.54	-0.06	0.65	0.43	-0.62	0.31	0.05
Malaysia	1.00	0.88	0.82	0.81	0.46	0.88	0.79	0.49	0.50	0.08	0.56	0.33	0.36	0.49	na
Morocco	1.00	0.81	0.85	0.79	0.61	0.44	0.54	0.18	0.15	0.28	-0.11	0.15	0.07	na	na
Pakistan	1.00	0.62	0.68	0.68	-0.15	0.38	0.36	0.52	0.20	0.13	-0.08	0.39	-0.06	0.19	na
Papua N.G.	1.00	0.31	0.76	0.68	0.64	-0.13	0.08	0.66	na	-0.33	0.28	na	na	na	na
Philippines	1.00	0.94	0.91	0.90	0.73	0.89	0.86	0.64	0.70	-0.01	-0.16	0.19	-0.63	0.76	na
Sri Lanka	1.00	0.62	0.38	0.42	-0.15	0.36	0.51	0.37	0.09	0.13	-0.02	-0.09	0.24	0.09	0.28
Thailand	1.00	0.84	0.80	0.78	0.37	0.82	0.73	0.51	0.45	0.51	0.12	0.15	-0.07	0.69	na
Tunisia	1.00	0.64	0.33	0.36	0.06	0.53	0.20	0.33	0.15	-0.04	0.19	na	na	0.13	na

Notes: See Table 6.a.

Table 11.b. *Cross Correlations for Asia and North Africa, BP*

	Gdp	Abs	Con	Pco	Pub	Inv	Imp	Exp	M2	Oda	Tot	Rer	Cpi	Cre	Wag
Algeria	1.00	0.36	0.27	0.31	0.04	0.32	0.30	0.93	0.21	-0.19	-0.13	na	na	0.08	na
Bangladesh	1.00	0.92	0.65	0.65	0.61	0.58	0.34	0.33	na	na	0.14	na	0.15	na	na
China	1.00	0.87	0.56	0.56	0.28	0.86	0.36	-0.02	na	na	0.11	na	na	na	na
Egypt	1.00	-0.02	0.18	na	na	-0.06	-0.17	0.58	0.20	0.00	-0.05	0.17	0.13	0.05	na
India	1.00	0.95	na	na	0.15	0.49	na	na	0.06	-0.06	0.13	0.25	0.10	0.36	na
Indonesia	1.00	0.35	0.32	0.31	-0.02	0.21	0.20	0.30	0.15	0.02	0.25	0.07	0.27	-0.13	na
Korea	1.00	0.90	0.61	0.72	-0.33	0.79	0.83	0.43	0.69	-0.12	0.56	0.47	-0.60	0.46	-0.10
Malaysia	1.00	0.74	0.57	0.62	-0.02	0.75	0.63	0.64	0.44	-0.02	0.75	0.35	0.21	0.31	na
Morocco	1.00	0.80	0.82	0.76	0.45	0.25	0.37	0.36	-0.03	0.14	-0.13	-0.03	0.05	na	na
Pakistan	1.00	0.63	0.70	0.67	-0.07	0.43	0.33	0.35	-0.26	0.11	0.10	0.38	0.32	-0.14	na
Papua N.G.	1.00	0.32	0.46	0.31	0.54	0.04	0.12	0.63	na	-0.14	0.03	na	na	na	na
Philippines	1.00	0.78	0.76	0.78	0.48	0.81	0.68	0.45	0.40	0.17	-0.21	-0.22	-0.68	0.48	na
Sri Lanka	1.00	0.29	0.39	0.44	-0.36	-0.06	0.13	0.28	-0.12	0.17	-0.16	-0.01	0.34	-0.17	0.23
Thailand	1.00	0.73	0.54	0.49	0.29	0.78	0.53	0.05	0.25	0.27	0.38	0.13	0.01	0.69	na
Tunisia	1.00	0.73	0.18	0.18	0.08	0.62	0.27	0.56	0.17	0.06	0.30	na	na	0.08	na

Notes: See Table 6.a.

V. DISCUSSION AND CONCLUSION

The design of appropriate stabilization policies in developing countries has attracted a lot of attention during the past two decades, almost to the extent that macroeconomic

stabilization and adjustment became synonymous with economic development. This is unfortunate for a number of reasons. Proper macroeconomic management is critical, but clearly only one item on the complex agenda facing policy makers in the third world and donor agencies. Moreover, Lucas (1981) argues that understanding the characteristics of the business cycle is the first step in designing appropriate stabilization policies. We have documented in this paper that this preparatory work is as yet far from complete. This is so in spite of the insightful contribution by Agénor, McDermott and Prasad (2000), who explicitly recognize their limited country coverage.

First, we found no evidence in the literature of any serious attention to the importance of the duration of the business cycle for the conclusions drawn about stylized facts. Second, based on a sample of 15 countries we estimated that the duration of business cycles in developing countries are clearly shorter than those in developed countries, and also the turning points vary. Business cycles in developing countries are different. Thirdly, we applied appropriate filters to capture a business cycle duration of no more than six years to a sample of 50 countries, including both low- and middle-income countries. It emerged that previous insights need considerable qualification.

The following conclusions stand out as regards the volatility of the 15 variables considered:

- Output is much more volatile in Sub-Saharan Africa than in industrialized countries and more volatile than in the Latin American, Asian and North African countries studied here. The expectation that there are fewer automatic stabilizers in developing countries seems to hold. Business cycle management is a greater challenge in developing countries.
- Consumption is more volatile than output in Sub-Saharan Africa and Latin America. The permanent income hypothesis is – in contrast to findings for industrialized countries – not supported by our data.
- Money and private sector credit are highly volatile across the three groups of developing countries included here. Monetary policy is used to pursue other goals than pure stabilization. This obviously makes stabilization an even more difficult task.

As regards cyclical properties, we conclude that:

- Both consumption and investment are strongly pro-cyclical. This is not surprising but has not so far been established in empirical studies for developing countries.
- Non-counter-cyclical government consumption is typical in all regions. Government seems to have a limited stabilizing role on the economy. The need to develop ways and means to change this situation remains a challenge in spite of the considerable attention paid to this issue over the past decades.
- Asia and North African countries do not provide a clear counter-cyclical picture as regards the trade balance due to strongly pro-cyclical exports. This is atypical both as compared to industrialized countries, Sub-Saharan African and Latin American countries. Deliberate economic policy does seem to interact with stylized facts.
- It is surprisingly difficult to identify any clear pattern as regards the terms of trade. It appears that the terms of trade are not as significant a destabilizing factor as often assumed.
- Money aggregates are generally pro-cyclical, but causality is unclear as is the case for industrialized countries. Research should continue to try to uncover whether money drives real variables or vice versa. However, the building of business cycle models without attention to monetary variables is likely to miss the target.
- Consumer prices show no consistent cyclical pattern in Sub-Saharan Africa, Asian and North African countries, but in Latin America the picture corresponds to the counter-cyclical features observed in developed countries. Demand driven models of the business cycle can largely be ruled out in Latin America, but not in the other developing countries.
- Foreign aid shows no signs of being pro-cyclical. The general picture is mixed and it does not seem warranted to conclude that aid exacerbates macroeconomic instability with adjacent welfare costs. Our results appear in line with those of Hansen and Tarp (2001), who argue that aid does seem in general to promote growth through savings-investment-growth linkages rather than being harmful to growth.

The above summary makes it clear that Sub-Saharan Africa does seem to stand out, whereas Asian and North African countries show business cycle properties more in line with those of developed countries. Latin America falls in between. In some ways this region resembles the developed world, but on other accounts, such as consumer prices, they show very different characteristics.

The empirical analyses of Agénor, McDermott and Prasad (2000) point to the importance of supply-side shocks in driving the business cycles in developing countries, and their results are in line with the numerical models put forward by Hoffmeister and Roldos (1997) for Asia and Latin America and Hoffmeister, Roldos and Wickman (1997) for Sub-Saharan Africa. They suggest that supply shocks are the main source of output fluctuations in developing countries - even in the short run. Our empirical results provide a more composite and complex picture of reality. On this basis, we would hesitate to rule out demand driven models a priori in analyzing business cycle features in developing countries. The choice of model should depend on country specific insights and circumstances. To uncover these characteristics country studies and country specific modeling are required.

In sum, business cycles in developing countries are different. This is so both for duration and turning points as well as the stylized facts that characterize third world countries. We argue that a wider range of theoretical models is required to fully understand the properties of business cycles across the developing world. The developing countries are a more diverse group than the rather uniform industrialized countries. This is yet another dimension along which developing countries are indeed different.

REFERENCES

Agénor, P., McDermott, C., and Prasad, E. (2000). Macroeconomic fluctuations in developing countries: some stylized facts. *The World Bank Economic Review*, 14 (2), 251-285.

Artis, M. J., Kontolemis, Z G., and Osborn, D. R. (1997). Classical business cycles for G7 and European countries. *Journal of Business*, 70(2), 249-279.

Baxter, M. and King, R. G. (1998). Measuring business cycles: approximate band-pass filters for economic time series. *Review of Economics and Statistics*, 81(4), 575-593.

Benhabib, J. and Farmer, R. (1996). Indeterminancies and Sector Specific Externalities. *Journal of Monetary Economics*, 37(3), 421-443.

Benhabib, J. and Farmer, R. (1994). Indeterminacy and Increasing Returns. *Journal of Economic Theory*, 63(1), 19–41.

Bry, G and Boschan, C. (1971). Cyclical analysis of time series: selected procedures and computer programs. NBER.

Burns, A. F. and Mitchell, W. C. (1946). Measuring business cycles. NBER

Burnside, C. (1998). Detrending and business cycle facts: A comment. *Journal of Monetary Economics* 41, 513 - 532.

Canova, F. (1998a). Detrending and business cycle facts. *Journal of Monetary Economics* 41, 475 - 512.

Canova, F. (1998b). Detrending and business cycle facts: A users guide. *Journal of Monetary Economics* 41, 533 - 540.

Danthine, J.P. and Donaldson, J. (1990). Efficiency wages and the Real Business Cycles. *European Economic Review*, 34, 1275-1301.

Giugale, M. M., Lafourcade, O. and Nguyen, V. H. (ed.) (2001). Mexico: A comprehensive development agenda for the new era. World Bank, Washington D.C.

Global Development Finance (2000), Cd-Rom, World Bank.

Hansen, H. and Tarp, F. (2001). Aid and growth regressions. *Journal of Development Economics* 64, 547 - 570.

Hodrick, R. J. and Prescott, E. C. (1997). Postwar US business cycles: An empirical investigation. *Journal of Money, Credit and Banking* 29(1), 1-16.

Hoffmeister, A. W. and Roldos, J. E. (1997). Are business cycles different in Asia and Latin America? IMF working paper 97/9.

Hoffmeister, A. W., Roldos, J. E. and Wickman, P. (1997). Macroeconomic fluctuations in Sub - Saharan Africa. IMF working paper 97/82.

IMF (2001a). Chile: Selected issues. Washington D.C.

IMF (2001b). Malawi: Selected issues and statistical appendix. Washington D.C.

International Development Statistics (2000), Cd-Rom, OECD.

International Financial Statistics (2000), Cd-Rom, IMF.

Kouparitsas, M. A. (2001). Evidence of the north - south business cycles. *Federal Reserve Bank of Chicago Economic Perspectives* 25(1), 24-45.

Kydland, F. E. and Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica* 50(6), 1345 - 1369.

Lucas, R. E. (1981). Studies in business cycle theory. MIT, Cambridge, MA.

Lustig, N. and Ros, J. (1993). Mexico. Published in: The rocky road to reform, L. Taylor (ed.). MIT, Cambridge, MA.

Mitchell, W. C. (1927). Business cycles: The problem and its settings. NBER.

Mosley, P., Harrigan, J. and Toye, J. (1991). Aid and Power: Vol. 2: Case studies. Routledge, London and New York

Pallage, S. and Robe, M. A. (2000). Magnitude X on the Richter scale: Welfare cost of business cycles in developing countries. CREPE working paper no. 124.

Pallage, S. and Robe, M. A. (2001). Foreign aid and the business cycle. *Review of International Economics* 9(4), 637-668.

Pedersen, T. M. (1998). How long are business cycles? Reconsidering fluctuations and growth. Discussion Paper 24. Institute of Economics, University of Copenhagen.

Ramey, G. and Ramey, V. A. (1995). Cross-Country Evidence on the Link between Volatility and Growth. *American Economic Review*, 85(5), 1138-1151.

Solimano, A. (1993). Chile. Published in: The rocky road to reform, L. Taylor (ed.). MIT, Cambridge, MA.

Stock, J. H. and Watson, M. W. (1999). Business cycle fluctuations in US macroeconomic time series. In Woodford and Taylor (eds.): Handbook of macroeconomics. Amsterdam, Holland.

World Development Indicators (2000). Cd-Rom. World Bank.